

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method of provisioning a first device operable with internet protocol (IP) in a virtual circuit network, the method comprising the computer-implemented steps of:
the first device requesting a list of identifiers corresponding to virtual circuits from a configuration interface for the virtual circuit network;
receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network; and
iteratively applying each identifier to individual instances of interface configuration commands until connectivity with a remote device is established, comprising the steps of:
requesting, from a second device terminating the virtual circuit corresponding to an identifier selected from the list, an IP address of the second device;
wherein the second device terminating the virtual circuit is operable to provide connectivity to the remote device;
wherein the second device terminating the virtual circuit is operable to route messages that are destined to the remote device, and wherein the remote device is operable to provide configuration information to configure the first device;
receiving the IP address of the second device terminating the virtual circuit corresponding to the identifier selected from the list;
determining an IP address for the first device;
testing the virtual circuit corresponding to the identifier selected from the list for connectivity with the remote device; and
if the virtual circuit corresponding to the selected identifier provides connectivity to the remote device, then choosing the virtual circuit corresponding to the selected identifier for connecting to the remote device, otherwise, iteratively applying the above steps for a next identifier in the list until the list is exhausted.

2. (Previously Presented) A method as recited in Claim 1, wherein the virtual circuit network comprises a frame relay network, and wherein the step of receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network further comprises:
receiving a Local Management Interface (LMI) message comprising a list of at least one of a plurality of Data Link Connection Identifiers (DLCIs) in the network.
3. (Previously Presented) A method as recited in Claim 1, wherein the virtual circuit network comprises an Asynchronous Transfer Method (ATM) relay network, and wherein the step of receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network further comprises:
receiving an Interim Local Management Interface (ILMI) message comprising a list of at least one of a plurality of Virtual Channel Identifiers or Virtual Path Identifiers (VCI/VPI) in the network.
4. (Previously Presented) A method as recited in Claim 1, wherein the step of iteratively applying each identifier to individual instances of interface configuration commands until connectivity with the remote device is established further comprises:
iteratively incorporating successive virtual circuit identifiers from the list into dynamically constructed commands to configure an interface to the virtual circuit network and successively applying the commands to the interface.
5. (Previously Presented) A method as recited in Claim 1, wherein the step of testing the virtual circuit corresponding to the identifier selected from the list for connectivity with the remote device further comprises the step of:
pinging the remote device, wherein the remote device comprises a configuration server.
6. (Previously Presented) A method as recited in Claim 1, wherein the step of requesting the IP address of the second device terminating the virtual circuit further comprises:
forming an Inverse Address Resolution Protocol Request (IARP); and

sending the IARP request to the second device terminating the virtual circuit.

7. (Previously Presented) A method as recited in Claim 1, wherein the step of determining the IP address for the first device comprises the steps of:
determining a netmask for the first device, wherein the subnet for the first device is smaller than or equal to a subnet of the second device terminating the virtual circuit corresponding to the selected identifier; and
determining the IP address for the first device valid in the subnet of the second device based upon the IP address of the second device terminating the virtual circuit.
8. (Previously Presented) A method as recited in Claim 7, wherein one or more of the steps of determining the netmask for the first device and determining the IP address for the first device valid in the subnet of the second device further comprise the steps of:
selecting a proposed netmask for a proposed subnet of smallest available size;
testing if the IP address of the second device terminating the virtual circuit is valid within the proposed subnet;
if the IP address of the second device terminating the virtual circuit is valid within the proposed subnet, then performing the following steps:
adding 1 to the IP address of the second device terminating the virtual circuit to form a first result, and testing whether the first result is a valid address;
if the first result is a valid address, choosing the first result as the IP address for the first device, otherwise, subtracting 1 from the IP address of the second device terminating the virtual circuit to form a second result and choosing the second result as the IP address for the first device;
otherwise, increasing the size of the proposed subnet and iteratively performing the above steps beginning with the testing step.
9. (Previously Presented) A method as recited in Claim 7, wherein one or more of the steps of determining the netmask for the first device and determining the IP address for the first device valid in the subnet of the second device further comprise the steps of:

determining a largest netmask less than or equal to 30 bits (255.255.255.252) such that

((ip_address_of _ the_device_terminating_VC & ~netmask) != 0) &&

((ip_address_of_the_device_terminating_the_VC | netmask) != ~0) is true;

adding 1 to the IP address of the second device terminating the virtual circuit to form a first result, and testing whether the first result is a valid address;

if the first result is a valid address, choosing the first result as the IP address for the first device, otherwise, subtracting 1 from the IP address of the second device terminating the virtual circuit to form a second result and choosing the second result as the IP address for the first device.

10. (Previously Presented) A method as recited in Claim 1, further comprising the step of:
automatically communicating an inventory of all interfaces associated with the first device to the remote device upon establishing connectivity with the remote device.
11. (Canceled)
12. (Currently Amended) A computer-readable volatile or non-volatile storage medium storing one or more sequences of instructions for provisioning a first device operable with internet protocol (IP) in a virtual circuit network, which instructions, when executed by one or more processors, cause the one or more processors to carry out the steps of:
the first device requesting a list of identifiers corresponding to virtual circuits from a configuration interface for the virtual circuit network;
receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network; and
iteratively applying each identifier to individual instances of interface configuration commands until connectivity with a remote device is established, comprising the steps of:
requesting, from a second device terminating the virtual circuit corresponding to an identifier selected from the list, an IP address of the second device;

wherein the second device terminating the virtual circuit is operable to provide connectivity to the remote device;

wherein the second device terminating the virtual circuit is operable to route messages that are destined to the remote device, and wherein the remote device is operable to provide configuration information to configure the first device;

receiving the IP address of the second device terminating the virtual circuit corresponding to the identifier selected from the list;

determining an IP address for the first device;

testing the virtual circuit corresponding to the identifier selected from the list for connectivity with the remote device; and

if the virtual circuit corresponding to the selected identifier provides connectivity to the remote device, then choosing the virtual circuit corresponding to the selected identifier for connecting to the remote device, otherwise, iteratively applying the above steps for a next identifier in the list until the list is exhausted.

13. (Previously Presented) A computer-readable volatile or non-volatile storage medium as recited in Claim 12, wherein the virtual circuit network comprises a frame relay network, and wherein the instructions for carrying out the step of receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network further comprise instructions for carrying out the step of: receiving a Local Management Interface (LMI) message comprising a list of at least one of a plurality of Data Link Connection Identifiers (DLCIs) in the network.
14. (Previously Presented) A computer-readable volatile or non-volatile storage medium as recited in Claim 12, wherein the virtual circuit network comprises an Asynchronous Transfer Method (ATM) relay network, and wherein the instructions for carrying out the step of receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network further comprise instructions for carrying out the step of:

receiving an Interim Local Management Interface (ILMI) message comprising a list of at least one of a plurality of Virtual Channel Identifiers or Virtual Path Identifiers (VCI/VPI) in the network.

15. (Previously Presented) A computer-readable volatile or non-volatile storage medium as recited in Claim 12, wherein the instructions for carrying out the step of iteratively applying each identifier to individual instances of interface configuration commands until connectivity with the remote device is established further comprise instructions for carrying out the step of:
iteratively incorporating successive virtual circuit identifiers from the list into dynamically constructed commands to configure an interface to the virtual circuit network and successively applying the commands to the interface.
16. (Previously Presented) A computer-readable volatile or non-volatile storage medium as recited in Claim 12, wherein the instructions for carrying out the step of testing the virtual circuit corresponding to the identifier selected from the list for connectivity with the remote device further comprise instructions for carrying out the step of:
pinging the remote device, wherein the remote device comprises a configuration server.
17. (Previously Presented) A computer-readable volatile or non-volatile storage medium as recited in Claim 12, wherein the instructions for carrying out the step of requesting the IP address of the second device terminating the virtual circuit comprises instructions for carrying out the steps of:
forming an Inverse Address Resolution Protocol Request (IARP); and
sending the IARP request to the second device terminating the virtual circuit.
18. (Previously Presented) A computer-readable volatile or non-volatile storage medium as recited in Claim 12, wherein the instructions for carrying out the step of determining the IP address for the first device comprise instructions for carrying out the steps of:

determining a netmask for the first device, wherein the subnet for the first device is smaller than or equal to a subnet of the second device terminating the virtual circuit corresponding to the selected identifier; and
determining the IP address for the first device valid in the subnet of the second device based upon the IP address of the second device terminating the virtual circuit.

19. (Previously Presented) A computer-readable volatile or non-volatile storage medium as recited in Claim 18, wherein the instructions for carrying out one or more of the steps of determining the netmask for the first device and determining the IP address for the first device valid in the subnet of the second device further comprise instructions for carrying out the steps of:
selecting a proposed netmask for a proposed subnet of smallest available size;
testing if the IP address of the second device terminating the virtual circuit is valid within the proposed subnet;
if the IP address of the second device terminating the virtual circuit is valid within the proposed subnet, then performing the following steps:
adding 1 to the IP address of the second device terminating the virtual circuit to form a first result, and testing whether the first result is a valid address;
if the first result is a valid address, choosing the first result as the IP address for the first device, otherwise, subtracting 1 from the IP address of the second device terminating the virtual circuit to form a second result and choosing the second result as the IP address for the first device;
otherwise, increasing the size of the proposed subnet and iteratively performing the above steps beginning with the testing step.
20. (Previously Presented) A computer-readable volatile or non-volatile storage medium as recited in Claim 18, wherein the instructions for carrying out one or more of the steps of determining the IP address for the first device valid in the subnet of the second device and determining the netmask for the first device further comprise instructions for carrying out the steps of:

determining a largest netmask less than or equal to 30 bits (255.255.255.252) such that

((ip_address_of _ the_device _terminating_VC & ~netmask) != 0) &&

((ip_address_of_the_device_terminating_the_VC | netmask) != ~0) is true;

adding 1 to the IP address of the second device terminating the virtual circuit to form a first result, and testing whether the first result is a valid address;

if the first result is a valid address, choosing the first result as the IP address for the first device, otherwise, subtracting 1 from the IP address of the second device terminating the virtual circuit to form a second result and choosing the second result is the IP address for the first device.

21. (Previously Presented) A computer-readable volatile or non-volatile storage medium as recited in Claim 12, further comprising instructions, which, when executed by the one or more processors, cause the one or more processors to carry out the step of: automatically communicating an inventory of all interfaces associated with the first device to the remote device upon establishing connectivity with the remote device.
22. (Currently Amended) An apparatus for provisioning a first device operable with internet protocol (IP) in a virtual circuit network, comprising:
 - in the first device, means for requesting a list of identifiers corresponding to virtual circuits from a configuration interface for the virtual circuit network;
 - means for receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network;
 - means for iteratively applying each identifier to individual instances of interface configuration commands until connectivity with a remote device is established, the means further comprising:
 - means for requesting, from a second device terminating the virtual circuit corresponding to an identifier selected from the list, an IP address of the second device;
 - wherein the second device terminating the virtual circuit is operable to provide connectivity to the remote device;

wherein the second device terminating the virtual circuit is operable to route messages that are destined to the remote device, and wherein the remote device is operable to provide configuration information to configure the first device;

means for receiving the IP address of the second device terminating the virtual circuit corresponding to the identifier selected from the list;

means for determining an IP address for the first device for use with the virtual circuit corresponding to the selected identifier providing connectivity to the remote device;

means for testing the virtual circuit corresponding to the identifier selected from the list for connectivity with the remote device.

23. (Previously Presented) An apparatus method as recited in Claim 22, wherein the virtual circuit network comprises a frame relay network, and wherein the means for receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network further comprises:
- means for receiving a Local Management Interface (LMI) message comprising a list of at least one of a plurality of Data Link Connection Identifiers (DLCIs) in the network.
24. (Previously Presented) An apparatus as recited in Claim 22, wherein the virtual circuit network comprises an Asynchronous Transfer Method (ATM) relay network, and wherein the means for receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network further comprises:
- means for receiving an Interim Local Management Interface (ILMI) message comprising a list of at least one of a plurality of Virtual Channel Identifiers or Virtual Path Identifiers (VCI/VPI) in the network.
25. (Previously Presented) An apparatus as recited in Claim 22, wherein the means for iteratively applying each identifier to individual instances of interface configuration commands until connectivity with the remote device is established further comprises:

means for iteratively incorporating successive virtual circuit identifiers from the list into dynamically constructed commands to configure an interface to the virtual circuit network and successively applying the commands to the interface.

26. (Previously Presented) An apparatus as recited in Claim 22, wherein the means for testing the virtual circuit further comprises:
means for pinging the remote device, wherein the remote device comprises a configuration server.
27. (Previously Presented) An apparatus as recited in Claim 22, wherein the means for requesting the IP address of the second device terminating the virtual circuit further comprises:
means for forming an Inverse Address Resolution Protocol Request (IARP); and
means for sending the IARP request to the second device terminating the virtual circuit.
28. (Previously Presented) An apparatus as recited in Claim 22, wherein the means for determining the IP address for the first device comprises:
means for determining a netmask for the first device, wherein the subnet for the first device is smaller than or equal to a subnet of the second device terminating the virtual circuit corresponding to the selected identifier; and
means for determining an IP address for the first device valid in the subnet of the second device based upon the IP address of the second device terminating the virtual circuit corresponding to the selected identifier.
29. (Previously Presented) An apparatus as recited in Claim 22, wherein one or more of the means for determining the netmask for the first device and the means for determining the IP address for the first device valid in the subnet of the second device further comprise:
means for selecting a proposed netmask for a proposed subnet of smallest available size;
means for testing if the IP address of the second device terminating the virtual circuit is valid within the proposed subnet;

means for adding 1 to the IP address of the second device terminating the virtual circuit to form a first result, if the IP address of second device terminating the virtual circuit is valid within the proposed subnet, and testing whether the first result is a valid address;

means for choosing the first result as the IP address for the first device if the first result is a valid address, otherwise, subtracting 1 from the IP address of the second device terminating the virtual circuit to form a second result and choosing the second result as the IP address for the first device; and

means for iteratively invoking the above means beginning with the means for testing.

30. (Currently Amended) An apparatus for provisioning a first device operable with internet protocol (IP) in a virtual circuit network, comprising:
- a network interface that is coupled to the virtual circuit network for receiving one or more packet flows via switched virtual circuits therefrom;
 - a processor;
 - one or more stored sequences of instructions which, when executed by the processor, cause the processor to carry out the steps of:
 - the first device requesting a list of identifiers corresponding to virtual circuits from a configuration interface for the virtual circuit network;
 - receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network; and
 - iteratively applying each identifier to individual instances of interface configuration commands until connectivity with a remote device is established, comprising the steps of:
 - requesting, from a second device terminating the virtual circuit corresponding to an identifier selected from the list, an IP address of the second device;
 - wherein the second device terminating the virtual circuit is operable to provide connectivity to the remote device;
 - wherein the second device terminating the virtual circuit is operable to route messages that are destined to the remote device, and wherein

the remote device is operable to provide configuration information to configure the first device;

receiving the IP address of the second device terminating the virtual circuit corresponding to the identifier selected from the list;
determining an IP address for the first device;
testing the virtual circuit corresponding to the identifier selected from the list for connectivity with the remote device; and
if the virtual circuit corresponding to the selected identifier provides connectivity to the remote device, then choosing the virtual circuit corresponding to the selected identifier for connecting to the remote device, otherwise, iteratively applying the above steps for a next identifier in the list until the list is exhausted.

31. (Previously Presented) An apparatus as recited in Claim 30, wherein the virtual circuit network comprises a frame relay network, and wherein the instructions for carrying out the step of receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network further comprises instructions for carrying out the step of:
receiving a Local Management Interface (LMI) message comprising a list of at least one of a plurality of Data Link Connection Identifiers (DLCIs) in the network.
32. (Previously Presented) An apparatus as recited in Claim 30, wherein the virtual circuit network comprises an Asynchronous Transfer Method (ATM) relay network, and wherein the instructions for carrying out the step of receiving the list of identifiers corresponding to virtual circuits from the configuration interface for the virtual circuit network further comprises instructions for carrying out the step of:
receiving an Interim Local Management Interface (ILMI) message comprising a list of at least one of a plurality of Virtual Channel Identifiers or Virtual Path Identifiers (VCI/VPI) in the network.

33. (Previously Presented) An apparatus as recited in Claim 30, wherein the instructions for carrying out the step of iteratively applying each identifier to individual instances of interface configuration commands until connectivity with the remote device is established further comprises instructions for carrying out the step of: iteratively incorporating successive virtual circuit identifiers from the list into dynamically constructed commands to configure an interface to the virtual circuit network and successively applying the commands to the interface.
34. (Previously Presented) An apparatus as recited in Claim 30, wherein the instructions for carrying out the step of testing the virtual circuit corresponding to the identifier selected from the list for connectivity with the remote device further comprises instructions for carrying out the step of: pinging the remote device, wherein the remote device comprises a configuration server.
35. (Previously Presented) An apparatus as recited in Claim 30, wherein the instructions for carrying out the step of obtaining the IP address for the second device terminating the virtual circuit corresponding to the selected identifier, further comprises: forming an Inverse Address Resolution Protocol Request (IARP); and sending the IARP request to the second device terminating the virtual circuit.
36. (Previously Presented) An apparatus as recited in Claim 30, wherein the instructions for carrying out the step of determining the IP address for the first device comprises instructions for carrying out the steps of: determining a netmask for the first device, wherein the subnet for the first device is smaller than or equal to a subnet of the second device terminating the virtual circuit; and determining the IP address for the first device valid in the subnet of the second device based upon the IP address of the second device terminating the virtual circuit.
37. (Previously Presented) An apparatus as recited in Claim 36, wherein one or more of the instructions for carrying out the step of determining the netmask for the first device

and the instructions for carrying out the step of determining the IP address for the first device valid in the subnet of the second device further comprise instructions for carrying out the steps of:

selecting a proposed netmask for a proposed subnet of smallest available size;

testing if the IP address for the second device terminating the virtual circuit is valid within the proposed subnet;

if the IP address for the second device terminating the virtual circuit is valid within the proposed subnet, then performing the following steps:

adding 1 to the IP address of the second device terminating the virtual circuit to form a first result, and testing whether the first result is a valid address;

if the first result is a valid address, choosing the first result as the IP address for the first device, otherwise, subtracting 1 from the IP address of the second device terminating the virtual circuit to form a second result and choosing the second result as the IP address of the first device,

otherwise, increasing the size of the proposed subnet and iteratively performing the above steps beginning with the testing step.

38. (Previously Presented) An apparatus as recited in Claim 36, wherein one or more of the instructions for carrying out the step of determining the netmask for the first device and the instructions for carrying out the step of determining the IP address for the first device valid in the subnet of the second device further comprise instructions for carrying out the steps of:
- determining a largest netmask less than or equal to 30 bits (255.255.255.252) such that
- $((\text{ip_address_of_the_device_terminating_VC} \& \sim \text{netmask}) \neq 0) \&\&$
- $((\text{ip_address_of_the_device_terminating_the_VC} \mid \text{netmask}) \neq \sim 0)$ is true;
- adding 1 to the IP address of the second device terminating the virtual circuit to form a first result, and testing whether the first result is a valid address;
- if the first result is a valid address, choosing the first result as the IP address for the first device, otherwise, subtracting 1 from the IP address of the second device terminating the virtual circuit to form a second result and choosing the second result as the IP address of the first device.

39. (Previously Presented) An apparatus as recited in Claim 30, further comprising instructions for carrying out the step of:
automatically communicating an inventory of all interfaces associated with the first device to the remote device upon establishing connectivity with the remote device.